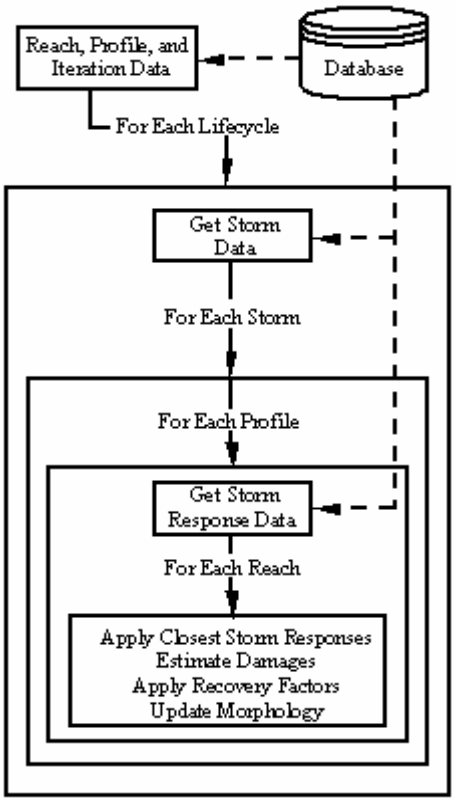
US Army Corps of Engineers®
Engineer Research and Development Center

Coastal Storm Protection Project Evaluation and Economic Analysis

Description

The Flood and Coastal Storm Damage Reduction research program is funding research to develop a capability to predict morphology evolution and the associated damages imparted by coastal storm events. The system also predicts the costs of shore protection alternatives with risk and uncertainty over multiple project lifecycles. Beach-*fx*, a Monte Carlo simulation model, will be developed, tested, enhanced and documented. The model links the predictive capability of coastal evolution models with project area infrastructure information (structure inventory), structural damage functions, and economic valuations to estimate the costs and benefits of alternative project designs. The model fully incorporates risk and uncertainty



Beach-*fx* Computational Flow.

Issue

Linkages between engineering analysis capabilities (project performance and evolution) and planning functions (alternative analysis and economic justification) with respect to coastal storm damage reduction projects require strengthening within the Corps. Present practice is inconsistent between field offices and often relies on locally developed models that may or may not incorporate risk and uncertainty. Standardized, risk-based economic justification for coastal storm damage reduction projects is required to promote consistent and defendable economic evaluations of coastal storm protection projects. A thorough and realistic approach to beach nourishment design is achieved through life cycle analyses.

Products

1. Documented and peer-reviewed engineering/economic Monte Carlo simulation model (Beach-*fx*). 2. Documented modeling tools and techniques to access and extract information from environmental databases and generate historically based plausible storm data sets. 3. Documented modeling tools to automate development of input data sets, execute coastal process model simulations and extract shore response and damage indicators from model outputs to populate a Shore Response Database. 4. Documented test-bed applications of Beach-*fx*. 5. Workshops that provide hands-on training in all aspects of Beach-*fx* application from development of environmental forcing and execution of coastal process simulation models through compilation of Beach-*fx* input data bases,

calibration and execution of Beach-*fx*, and visualization and interpretation and Beach-*fx* output.

Supporting Technology

Beach-*fx* relies upon a Shore Response Database (SRD) for estimation of morphology evolution that is populated based on results from coastal morphology change numerical models SBEACH (short-term storm-induced beach profile change), and GENESIS (long-term shoreline evolution) as well as the nearshore wave transformation model STWAVE and multiple supporting computer routines contained in the *Beach* module of the Coastal Engineering Design and Analysis System (CEDAS).

Benefits

This research will provide the Corps with the capability to generate standardized risk-based economic justification for coastal storm damage reduction projects. This capability is required to promote consistent and defendable economic evaluations of coastal storm damage reduction projects throughout the Corps.

Sponsors

This research is funded through direct congressional allotment to the Flood and Coastal Storm Damage Reduction research program and executed by CHL Coastal Processes Branch.

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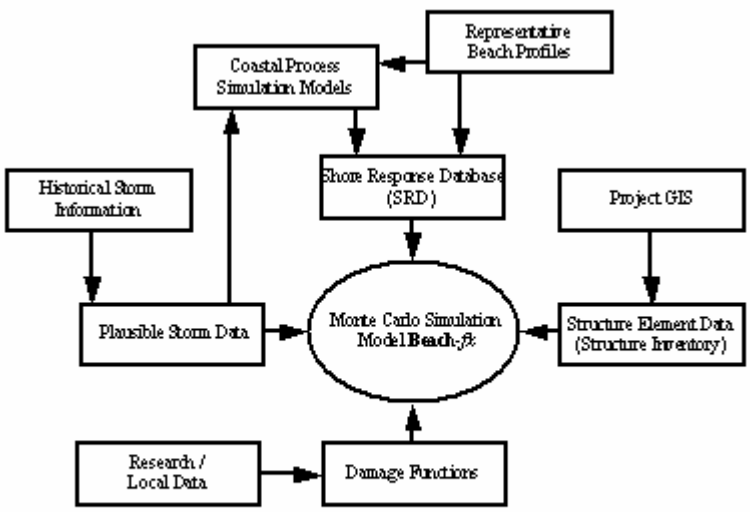

Beach-*fx* Data Flow.